ORIGINAL ARTICLE

Necessity breeds invention: a study of outpatient management of low velocity gunshot wounds

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Background: Since the late 1980s, the emergency department (ED) at the Mater Hospital, Belfast, has implemented a policy of treating conservatively patients who sustain low velocity gunshot wounds to the lower limbs. Wounds are cleaned and minimally debrided under local anaesthetic in the ED. Patients are given oral antibiotics, and reviewed 48 hours later at the ED review clinic.

Objective: To investigate the outcome of outpatient ED management of low velocity gunshot wounds to the lower limbs.

Method: This was a retrospective, observational study from January 2000 to September 2004 inclusive. Notes were retrieved of those patients who had gunshot wound mentioned in the triage text. Patients were included if they presented with a low velocity gunshot wound to the lower limbs. Demographics and treatment regimen were recorded.

Results: In total, 90 patients sustained low energy injuries to the lower limb, with 70.5% of wounds involving the skin and soft tissue only. Most patients (n = 67) were treated as outpatients, which included 80% of unilateral injuries and 46.6% of bilateral injuries presented. There were 56 patients reviewed at clinic. Three patients developed minor complications

Conclusion: Irrigation and minimal debridement in the outpatient setting is an acceptable method of treatment for low energy gunshot wounds to the lower limbs, without orthopaedic or vascular involvement.

At the height of the civil unrest in Northern Ireland, the Mater Hospital Belfast received more gunshot wounds per annum than any other hospital in western Europe. Owing to the volume of patients, the hospital adopted a conservative approach to the management of selected patients. Patients who received low energy gunshot wounds to the lower limbs, without orthopaedic or vascular involvement, were managed with minimal surgical debridement and cleaning under local anaesthetic. Their morbidity rates were comparable to those patients who were treated with general anaesthetic, extensive cleaning, and debridement.[1 2]

Following on from this, the ED implemented a policy of treating selected patients in the outpatient setting.

Treatment regimen

On presentation, a focused history is obtained. Only patients who have a low energy wound to the lower limb are considered. Provided no exclusion criteria exist (table 1), the patient qualifies for outpatient management. Under local anaesthetic, the entrance wound (and exit wound, if necessary) is minimally debrided, and the bullet tract irrigated by syringing with sterile preparations. The entrance wound is lightly packed with paraffin gauze or iodine wick, then dressed. Tetanus status is reviewed and co-amoxiclav (or erythromycin if penicillin sensitive) prescribed. Patients are reviewed 48 hours later.

This policy has been running for 10 years. Until now, it has not been formally reviewed. The goal of this investigation was to investigate the outcome of outpatient ED treatment of low velocity gunshot wounds to the lower limbs.

METHODS

This was a retrospective, observational study from January 2000 to September 2004 inclusive in the ED of Mater Hospital, Belfast. Notes were retrieved of those patients who had gunshot wound mentioned in the triage text, and were included if they presented following a low velocity injury to the lower limb. Age, date of birth, sex, treatment in ED, investigations (radiography, blood investigations, Doppler imaging), number of reviews, morbidity, and patient outcome were recorded.

Statistical analysis

Results were captured on a Microsoft Excel spreadsheet and analysed by the hospital statistics department.

RESULTS

Over the period studied, 159 patient attendances fitted the inclusion criteria. Of these, 54 were excluded for various reasons; for example, attendances were found to be revisits. The notes of a further 15 patients could not be traced. This left 90 patients who had sustained low velocity wounds to the lower limb. The age range of the patients and area of limb injured are shown in fig 1.

The 23 patients required admission and were excluded from the study. They comprised: eight patients with bony involvement, one patient requiring vascular intervention, and a further patient requiring skin grafting. The remaining 15 further patients were admitted under the care of a general surgeon. No reason was given in the ED notes for the decision to admit. Four of the 15 had bilateral calf injuries and seven

Table 1 A thorough lower limb neurovascular examination is carried out

Exclusion criteria
Evidence of vascular injury i.e. excessive haemorrhage, pulse deficit, bruit, ischaemia
Evidence of neurological injury
Bullet track traversing joint
Unable to fully assess limbs due to, for example, ethanol or drug ingestion
Radiological evidence of orthopaedic involvement or foreign body

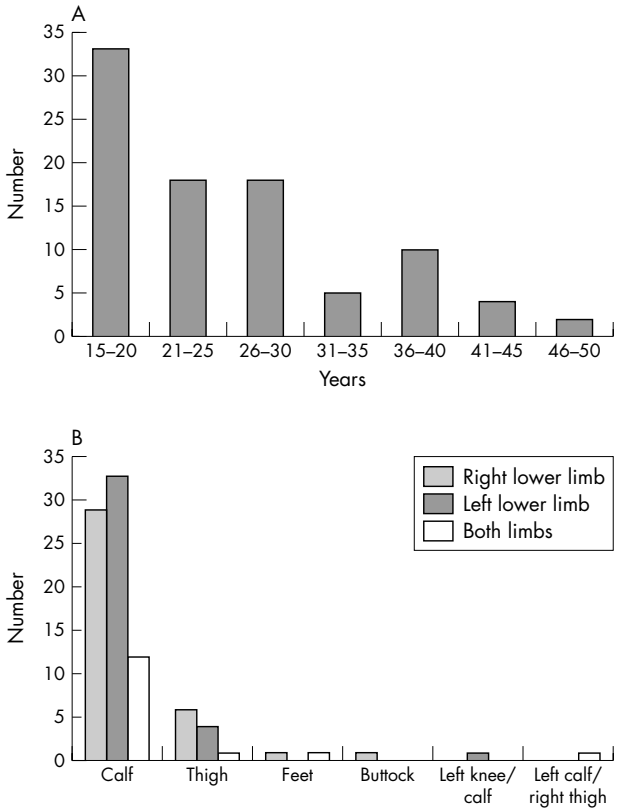

Figure 1 (A) Age range of patients presenting with low velocity gunshot wounds to lower limbs. The patients were all male and their ages ranged from 15 to 49 years, with the average age being 25.6 years. (B) Area of lower limb injured following low velocity gunshot wound: 41% of patients sustained right lower limb injuries, 42% left, and 16% both; 82% involved the calf. There were 105 wounds in total. Radiography was carried out on 89 patients (one patient's wounds were superficial and radiography deemed unnecessary), 26 patients had laboratory testing, and 1 received a Doppler ultrasound.

had thigh injuries. Of the 67 outpatients, 56 received full the treatment regimen. Seven patients had no documentation as to whether or not they received lignocaine. Two further patients required cleaning only. Two patients refused debridement and were given oral antibiotics.

The majority (84%) of patients treated as outpatients were reviewed at the ED clinic (fig 2). The remaining 16% were either reviewed by a general practitioner (9%) or discharged (7%), and were lost to follow up.

Of the patients reviewed in the ED, 53% received oral antibiotics only, 46% received oral and intravenous antibiotics, and 1% received neither. In the oral group (n = 30), 27 had unilateral calf injuries, 1 had bilateral calf injuries, 1 had thigh injuries, and 1 buttock injuries. In the group that received both oral and intravenous (n = 26), 19 had calf injuries, 3 thigh injuries, and 4 had injuries to both calves.

The majority of patients reviewed at the ED clinic were seen within 3 days (77%); 70% required two or fewer reviews, and 18% of appointments were not attended.

Three of the patients reviewed developed wound complications (table 2). All three had received a gunshot wound to the left calf and received oral antibiotics only. Patient 1 developed cellulitis soon after injury and patient 2 developed a wound infection 3 weeks after his injury. Patient 3 developed a wound infection. He was non-compliant with oral antibiotics, which may have contributed. None of the patients required surgical intervention.

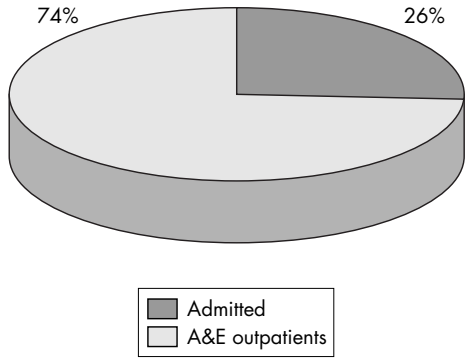

Figure 2 Outcome of patients presenting with low velocity gunshot wounds to lower limbs. There were 67 patients who qualified for outpatient treatment; 7 had sustained bilateral injuries and 60 had unilateral injuries.

Table 2 Complications following outpatient management of low velocity gunshot wounds to the lower limb

Patient	Complication	Treatment	Outcome	No. of reviews
1	Cellulitis	OA	Discharged	3
2	wound infection	OA	Discharged	2
3	wound infection	OA	Discharged	3

OA, oral antibiotics.

DISCUSSION

The original research into conservative management of low velocity gunshot wounds was carried out in the late 1980s in the Mater Hospital, Belfast.[1] In their study, Ritchie *et al* reviewed 220 wounds, 58% of which were found to involve skin and soft tissue only. They took a group of patients treated in the conventional manner (general anaesthetic, wide debridement, and exploration) and compared them with another group treated conservatively (minimal debridement and washout). The two groups had comparable morbidity rates and the conservative group required fewer days in hospital (average 3.6 days). In our study, a higher percentage of wounds (70.5%) involved soft tissue only, thus 74% of patients were treated as outpatients, resulting in 266.4 in patient days saved.

These differences have to be judged in the context of the changing political climate in Northern Ireland. Since the 1994 paramilitary ''ceasefire'', gunshot injuries are now predominantly low velocity. The patients in our study had sustained ''punishment shooting'' style injuries. These are carried out by paramilitary organisations to deter those they feel are involved in antisocial behaviour. The victim, with his trousers rolled up, is shot at close range, usually with a 9 mm handgun, transversely through the calf.[3 4] This produces a consistent injury pattern.

In our study, the minor complication rate was 5.3%. Ordog *et al* quoted a rate of 1.8% for minor wounds.[5] However, many of the wounds they described were superficial, and follow up was by telephone enquiry only.

In our study, the three patients with complications had received oral antibiotics only. It could be argued that patients may benefit from an initial dose of intravenous antibiotic at the time of presentation. The use of antibiotics in low energy gunshot injuries is still open to debate.[6 7] Ritchie *et al* advocated intravenous antibiotics on presentation, but they

had not continued on with oral antibiotics. In our study, the choice of oral or intravenous antibiotics was dependent on the clinician who treated the patient. As the study did not set out to compare the infection rates between those who did and did not receive intravenous antibiotics, further research comparing two groups in a prospective study would be necessary before deciding whether or not to advocate the use of intravenous antibiotics in all patients.

Some authors would argue that any antibiotics and wound debridement, in simple low velocity gunshot wounds, are unnecessary.[5] However, no randomised controlled trial exists to support this practice. The development of wound infection is dependent on many factors including patient characteristics, initial contamination, and delay in treatment. At present, it would seem prudent to assess the need for antibiotics and debridement on a case by case basis.

Limitations of the study

A coding system was not in place in the hospital during the period being studied. Therefore, a number of patients presenting with gunshot wounds may have been missed. Only patients whose notes were available were included in the study.

The complication rate may be higher as 11 outpatients were lost to follow up.

CONCLUSION

Irrigation and minimal debridement in the outpatient setting, is an acceptable method of treatment for selected uncomplicated low velocity gunshot wounds to the lower limbs. The injuries sustained by our patient population were quite unique to Northern Ireland. Therefore, when using this treatment regimen to manage the general population, it is important to ensure no orthopaedic or vascular involvement.

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